the area ratio of the negative and positive electrodes is such that the element resistance measured between the negative and positive electrodes is 94% or less than the element resistance of the same sensor except in which the negative electrode and the positive electrode have the same area.

17. (New) The sensor element as claimed in claim 16, wherein the ratio of the area of the negative electrode to the area of the positive electrode is within the range of 2:1 to 5:1, the circuit applies an electric potential of from 0.2 V to 1.1 V, and the element resistance measured between the negative and positive electrodes is from 94% to 86% of the element resistance of the same sensor except in which the negative electrode and the positive electrode have the same area.

18. (New) The sensor element as claimed in claim 16, wherein the ratio of the area of the negative electrode to the area of the positive electrode is within the range of 2:1 to 5:1, the circuit applies an electric potential of from 1.1 V to 2.5 V, and the element resistance measured between the negative and positive electrodes is from 81% to 63% of the element resistance of the same sensor except in which the negative electrode and the positive electrode have the same area.

19. (New) The sensor element as claimed in claim 16, wherein the ratio of the area of the negative electrode to the area of the positive electrode is within the range of 1:2 to 1:5, the circuit applies an electric potential of from 0.2 V to 1.1 V, and the element resistance measured between the negative and positive electrodes is from 74% to 73% of the element

resistance of the same sensor except in which the negative electrode and the positive electrode have the same area.

20. (New) The sensor element as claimed in claim 16, wherein the ratio of the area of the negative electrode to the area of the positive electrode is within the range of 1:2 to 1:5, the circuit applies an electric potential of from 1.1 V to 2.5 V, and the element resistance measured between the negative and positive electrodes is from 90% to 82% of the element resistance of the same sensor except in which the negative electrode and the positive electrode have the same area.

21. (New) The sensor element as claimed in claim 16, wherein the negative and positive electrodes have an area ratio which minimizes the element resistance measured between the negative and positive electrodes.

22. (New) The sensor as claimed in claim 16, wherein said solid electrolyte substrate comprises zirconia.

23. (New) The sensor as claimed in claim 16, wherein the negative and positive electrodes comprise porous platinum.

24. (New) A flat current-limiting sensor comprising a sensor element according to claim 16.

25. (New) A sensor for determining a concentration of a gas, comprising first and second chambers (62,64) formed between first and second oxygen ion conductive cell substrates

(66,68) and first and second electrodes (68a,68b) formed on the same plane of the second cell substrate (68), said first electrode (68a) being formed on an inside wall of the second chamber (64) and said second electrode (68b) being formed outside of the second chamber (64),

wherein the area of the first electrode is at least twofold larger than that of the second electrode, and

wherein a pump current of less than 100 microamperes flows between the first and second electrodes when the sensor is used to determine the concentration of a gas, said pump current being a measurement of gas concentration.

26. (New) The sensor as claimed in claim 25, wherein a pump current of less than 10 microamperes flows between the first and second electrodes.

27. (New) The sensor as claimed in claim 25, comprising a circuit for applying an electric potential in the range of 0.2 V to 1.1 V between said first and second electrodes.

28. (New) The sensor as claimed in claim 25, comprising a circuit for applying an electric potential in the range of 1.1 V to 2.5 V between said first and second electrodes.

29. (New) The sensor as claimed in claim 25, comprising a circuit for applying an electric potential in the range of 0.2 V to less than 0.5 V.

~~31.~~ 30. (New) A sensor for detecting an amount of a gas, comprising

an oxygen-ion conductive solid electrolyte substrate having a flat side, a negative electrode and a positive electrode formed on the same flat side of the substrate so as to pump

oxygen from the negative electrode to the positive electrode, and a gas diffusion limiting means for limiting the gas diffusing into the negative electrode,

wherein the ratio of the area of said negative electrode to the area of said positive electrode is set within a range of 2:1 to 5:1, and

wherein a pump current of less than 100 microamperes flows between the negative and positive electrodes when the sensor is used for detecting the amount of a gas, said pump current being a measurement of the amount of gas.

~~32.~~ 31. (New) A sensor for detecting an amount of a gas, comprising

an oxygen-ion conductive solid electrolyte substrate having a flat side, a negative electrode and a positive electrode formed on the same flat side of the substrate so as to pump oxygen from the negative electrode to the positive electrode, and a gas diffusion limiting means for limiting the gas diffusing into the negative electrode,

wherein the ratio of the area of said negative electrode to the area of said positive electrode is set within a range of 1:2 to 1:5, and

wherein a pump current of less than 100 microamperes flows between the negative and positive electrodes when the sensor is used to detect the amount of a gas, said pump current being a measurement of the amount of gas.